

REMARKS

This application has been carefully reviewed in light of the Office Action dated September 26, 2002. Claims 46 and 47 have been added to round out the scope of protection for the invention. Claims 1-17 and 46-47 are now pending in the application. Applicants respectfully request reconsideration of the above-referenced application in light of the amendments and following remarks.

Claim 46 has been added to recite that the “first and second doping regions are chemically isolated from one another by an inert gas curtain . . . [which] is provided at a higher pressure than said first dopant species.” Support is found in Applicants’ specification on page 18, lines 19-21.

Claim 47 has been added to recite that the “first dopant gas species [is] exhausted through a first gas port” and that a second atomic layer doping region is provided “for diffusing said first dopant gas species in said first substrate with a non-reactive gas species . . . wherein the non-reactive gas species is exhausted through a second gas port.” Support is found in Applicants’ specification on page 15, lines 4-9.

Claims 1-4, 6-8, and 10-17 stand rejected under 35 U.S.C. §103(a) as being unpatentable over McInerney et al. (U.S. Patent No. 6,319,553) (“McInerney”) in view of Fong et al. (U.S. Patent No. 5,935,334) (“Fong”). Reconsideration is respectfully requested.

McInerney in view of Fong does not disclose the subject matter of claim 1. McInerney teaches a multi-station processing chamber useful for ‘incompatible processes,’ such as when “incompatible reactive gases . . . are used.” (Col. 1, lines 27-33). McInerney does not teach a first atomic layer region used for deposition and a second atomic layer region used for thermal diffusion of a dopant species. McInerney teaches the use of different reactive gases in each processing chamber.

Fong does not teach “deposition of a dopant species in a first processing region and transfer to a second processing region” as the Office Action asserts. In fact, Fong teaches away from using two separate processing regions. Fong is directed to providing an apparatus which “enables multiple process steps to be performed in situ in the same chamber to reduce total processing time and to ensure high quality processing.” (Col. 7, lines 24-26) (emphasis added). Further, “processing is accomplished without removing the wafer from the vacuum chamber, which advantageously reduces moisture absorption in the dielectric film.” (Col. 7, lines 64-67) (emphasis added).

Applicants do not understand the Office Action’s contention that “column 41, row 61 – column 62, row 12” teaches a second processing region for thermal diffusion of the dopant species. In fact, Fong teaches that “[a]fter deposition of doped dielectric layer 1008, the wafer remains in chamber 15 . . . [and the] wafer thereon are then heated to a higher temperature.” (Col. 41, lines 61-65) (emphasis added).

Accordingly, McInerney and Fong are not properly combinable. Fong teaches multiple processing in the same chamber while McInerney teaches multiple processing in different chambers. Further, the references fail to teach or suggest an atomic doping apparatus comprising “a first atomic layer doping region for depositing a first dopant species on a first substrate as a monolayer, a second atomic layer doping region for diffusing said first dopant species in said first substrate, said first and second doping regions being chemically isolated from one another,” as claim 1 recites.

For at least the reasons described above, dependent claims 2-4, 6-8, 10-17, and are similarly allowable.

Claim 5 stands rejected under 35 U.S.C. §103(a) as being unpatentable over McInerney and Fong as applied to claims 1-4, 6-8 and 10-17 above, and further in view of Straemke (U.S. Patent No. 6,056,849). Reconsideration is respectfully requested.

Dependent claim 5, which includes all limitations of independent claim 1, is allowable for the reasons provided above for independent claim 1. Further, as also provided above, McInerney and Fong are not properly combinable.

Moreover, one skilled in the art would not have been motivated to combine Straemke with either of the cited references. Straemke discloses introducing the same gas into the processing chamber (11) as into the treatment chamber (10) (Abstract). Straemke also discloses that “the same gas is introduced into the processing chamber 11 until the pressure between the two chambers 10, 11 has been equalized.” (Col. 4, lines 63-66) (emphasis added). McInerney teaches away from equalizing the pressure between two processing chambers and from utilizing the same gas in the processing chambers. “[R]eactive gases may combine in an undesirable manner resulting in contamination of the wafers.” (Col. 10, lines 1-3) (emphasis added). Accordingly, McInerney is not properly combinable with Straemke.

Claim 9 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over McInerney and Fong as applied to claims 1-4, 6-8 and 10-17 above, and further in view of Henley et al. (U.S. Patent No. 6,207,005 B1) (“Henley”). Reconsideration is respectfully requested.

Dependent claim 9, which includes all limitations of independent claim 1, is allowable for the reasons provided above for independent claim 1. Henley adds nothing to correct the deficiencies found in McInerney and Fong. As discussed above, McInerney and Fong are not properly combinable.

In addition, new claims 46 and 47 are not taught or suggested by the prior art. The prior art fails to teach or suggest an inert gas curtain which provided at a higher pressure than the first dopant species as claim 46 recites, nor that the first dopant gas species is exhausted through a first gas port and that the second atomic layer doping region is provided for diffusing the first dopant gas species into the substrate with a non-reactive gas species, wherein the non-reactive gas species is exhausted through a second gas port.

These are additional structural differences between the applicants' invention and the prior art of record.

There are several important features of claims 1-17 and 46-47 that are not taught anywhere in the cited prior art. Accordingly, the rejection of claims 1-17 should be withdrawn. Allowance of the application with claims 1-17 and 46-47 is respectfully solicited.

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Respectfully submitted,

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